

Multi-decadal change of atmospheric aerosols and their effect on surface radiation

MIAN CHIN^{1*}, THOMAS DIEHL^{1,2}, QIAN TAN^{1,2}, DAVID STREETS³, MARTIN WILD⁴, YUN QIAN⁵, HONGBIN YU^{1,6},
HUI SHENG BIAN^{1,2}, AND WEIGUO WANG⁷

¹NASA Goddard Space Flight Center, Greenbelt, Maryland, 20771, USA (*correspondance: mian.chin@nasa.gov)

²University of Maryland Baltimore County, Baltimore, Maryland, USA

³Argonne National Laboratory, Chicago, Illinois, USA

⁴ETH, Zurich, Switzerland

⁵Pacific Northwest National Laboratory, Redland, Washington, USA

⁶University of Maryland College Park, College Park, Maryland, USA

⁷NOAA NCEP, Camp Springs, Maryland, USA

We present an investigation on multi-decadal changes of atmospheric aerosols and their effects on surface radiation using a global chemistry transport model along with the near-term to long-term data records. We focus on a 28-year time period of satellite era from 1980 to 2007, during which a suite of aerosol data from satellite observations and ground-based remote sensing and in-situ measurements have become available. We analyze the long-term global and regional aerosol optical depth and concentration trends and their relationship to the changes of emissions, and assess the role aerosols play in the multi-decadal change of solar radiation reaching the surface (known as “dimming” or “brightening”) at different regions of the world, including the major anthropogenic source regions (North America, Europe, Asia) that have been experiencing considerable changes of emissions, dust and biomass burning regions that have large interannual variabilities, downwind regions that are directly affected by the changes in the source area, and remote regions that are considered to representing “background” conditions.